# 1.0 Introduction

The Bureau of Reclamation (Reclamation) is conducting the Odessa Subarea Special Study (Study) to investigate the continued phased development of the Columbia Basin Project (CBP) to replace groundwater currently used for irrigation in the Odessa Ground Water Management Subarea (Odessa Subarea) with CBP surface water. Reclamation has completed appraisal-level investigations of four water delivery alternatives and six water supply options that could provide a replacement surface water supply. The alternatives and options include constructing a new canal system or enlarging and expanding existing canals, as well as possibly constructing new storage facilities. The investigation examined the engineering viability, developed preliminary cost estimates, and identified potential environmental and social issues. This report documents the investigations.

## 1.1 Study Authority

The CBP is a multipurpose development in the central part of the state of Washington (State). The key structure, Grand Coulee Dam, is on the mainstem of the Columbia River about 90 miles west of Spokane, Washington. The Grand Coulee Dam Project was authorized for construction by the Act of August 30, 1935, and reauthorized and renamed in the Columbia Basin Project Act of March 10, 1943. Congress authorized the CBP to irrigate a total of 1,029,000 acres; about 671,000 acres are currently irrigated.

The 1943 Columbia Basin Project Act subjected the CBP to the requirements of the Reclamation Project Act of 1939. Section 9(a) of the 1939 Act gave authority to the Secretary of the Interior (Secretary) to approve a finding of feasibility and thereby authorize construction of a project upon submitting a report to the President and the Congress. The Secretary approved a plan of development for the Columbia Basin Project (Reclamation 1944), which was then transmitted as a joint report, known as House Document No. 172, to the President and to the House Irrigation and Reclamation Committee in 1945, thereby satisfying these requirements. (When the Secretary recommended a project to Congress, the feasibility report and Reclamation's Regional Director's report were customarily printed as a House Document.) The Odessa Subarea Special Study is conducted under the authority of this Act, as amended, and the Reclamation Act of 1939.

Congress authorized the continued irrigation development of the CBP using a phased development approach. House Document No. 172 anticipated about a 70-year period of incremental development to complete the CBP. Reclamation is authorized to implement additional phases as long as the Secretary finds it to be economically justified and financially feasible.

This Study is a special study investigating another developmental phase of the CBP. The Study will involve a feasibility-level analysis, as it is anticipated that the Office of Management and Budget and other decisionmakers may require this level of analysis before appropriations for new construction will be made. Further, this study approach will help the Secretary determine the financial and economic feasibility of a preferred alternative as stipulated in current contract provisions with CBP beneficiaries.

## 1.2 Purpose and Need

Groundwater in the Odessa Subarea is currently being depleted to such an extent that water must be pumped from great depths. Pumping depths are 750 feet in some areas, and well depths are as great as 2,100–2,400 feet. Well drilling well costs and pumping water from this depth have resulted in expensive power costs and water quality concerns such as high water temperatures and high sodium concentrations. The ability of farmers to irrigate their crops is at risk. Domestic, commercial, municipal, and industrial uses and water quality are also affected. Those irrigating with wells of lesser depth live with uncertainty about future well production (See Section 2.4.4, "Water-level Declines").

Washington State University conducted a regional economic impact study assessing the effects of lost potato production and processing in Adams, Franklin, Grant, and Lincoln counties from continued aquifer decline. Assuming that all potato production and processing is lost from the region, the analysis estimated the regional economic impact would be a loss of about $630 million dollars annually in regional sales, a loss of 3,600 jobs, and a loss of $211 million in regional income (Bhattacharjee and Holland 2005).

Another study examined the regional economic impacts for Adams and Lincoln counties from possible agricultural production losses for other crops that might result with continued aquifer decline (Razack and Holland 2007). Two scenarios were examined. One scenario assumed a 10 percent reduction in agricultural production would occur with an estimated $20 million reduction in regional income and a 295 job loss for the two counties (Razack and Holland 2007). A second scenario assumed a 10 percent crop production loss combined with loss of the frozen potato processing product in the two counties would occur with an estimated $30 million loss of regional income and a 465 job loss for the two counties. If all deep well agricultural production were lost, an estimated 4650 jobs would be lost, equating to about 32 percent of total jobs in the two counties.

Action is needed to avoid significant economic loss to the region's agricultural sector because of resource conditions associated with continued decline of the aquifers in the Odessa Subarea. The purpose of actions proposed in this report is to meet this need by replacing the current and increasingly unreliable groundwater supplies with a surface supply from the CBP as part of continued phased development of the CBP as authorized. An estimated 170,000 acres within the Odessa Subarea are now being irrigated with groundwater. An estimated 140,000 of these acres are within the Study area boundaries. See Section2.1, "Study Location."

## 1.3 Study Background

As mentioned previously, the CBP is authorized to irrigate 1,029,000 acres; about 671,000 acres (approximately 65 percent of the acreage authorized by Congress) are currently irrigated. These lands, known as first half lands, were developed primarily in the 1950s and 1960s, with some acreages being added sporadically until 1985. Prior studies examined the merits of continuing the incremental development approach for the CBP. However, for various reasons, development did not occur.

The State issued irrigation groundwater permits in the 1960s and 1970s in the Odessa Subarea as a temporary measure until the CBP was developed to provide surface water to these lands. The aquifer has now declined to such an extent that the ability of farmers to irrigate their crops is at

risk and domestic, commercial, municipal, and industrial uses and water quality are affected. Local constituents have advocated that Reclamation investigate CBP development to replace groundwater with CBP water as a possible solution for issues associated with the declining aquifer. In response to public concern about associated economic and other effects, Congress provided funding to Reclamation beginning in fiscal year 2005 to investigate opportunities to provide CBP water to replace groundwater use in the Odessa Subarea.

The State supports investigation of CBP development to provide a replacement for current groundwater irrigation. The State, Reclamation, and the CBP irrigation districts signed the Columbia River Initiative Memorandum of Understanding (CRI MOU) in December 2004, to promote a cooperative process for implementing activities to improve Columbia River water management and water management within the CBP. The Odessa Subarea Special Study implements Section 15 of the CRI MOU, which states in part that, "The parties will cooperate to explore opportunities for delivery of water to additional existing agricultural lands within the Odessa Subarea." The State provided a cost-share through an Intergovernmental Agreement between Washington Department of Ecology (Ecology) and Reclamation in December 2005 to fund this Study.

In February 2006, the State legislature passed the Columbia River Water Resource Management Act (HB 2860) that directs Ecology to aggressively pursue development of water benefiting both instream and out-of-stream uses through storage, conservation, and voluntary regional water management agreements. Reclamation's Odessa Subarea Special Study is one of several activities identified in the legislation. Additional Study background is located at: <http://www.usbr.gov/pn/programs/ucao_misc/Odessa/>.

## 1.4 Previous Study-Related Investigations

Reclamation began the Study in 2005. A *Plan of Study* (Reclamation 2006 [Odessa POS]) was first published that provided study background and purpose, described potential issues, outlined study steps and requirements, and identified required resources.

Reclamation completed a pre-appraisal-level investigation through a Project Alternative Solutions Study (PASS) late in 2006. The investigation is documented in a report entitled *Initial Alternative Development and Evaluation, Odessa Subarea Special Study* (Reclamation 2006 [PASS]).

The PASS was conducted with the assistance of two teams: the Objectives Team and the Technical Team. The Objectives Team was comprised of various stakeholders in the Study area including Federal and State agencies, local governments, Tribes, CBP irrigation districts, and groundwater irrigators. This team developed Study objectives that were used to rank alternative concepts, including:

- Replace all or a portion of current groundwater withdrawals within the Study area with CBP water.
- Maximize use of existing infrastructure.
- Retain the possibility of full CBP development in the future.
- Address Endangered Species Act (ESA) issues.

- Meet National Marine Fisheries Service (NMFS) seasonal flow objectives.
- Address the potential impact to shrub-steppe habitat for ESA-listed species.
- Provide environmental and recreational enhancements.
- Minimize potential delay in the Study schedule.
- Be developed in phases.

The Technical Team was comprised of engineers, a hydrogeologist, a watermaster, and irrigation district managers from Reclamation, Ecology, and the CBP irrigation districts. The Technical Team developed preliminary alternative concepts, suggested by the public and examined in previous investigations, and ranked them using the Study objectives developed by the Objectives Team. The Technical Team then recommended water delivery alternatives and water supply options for further study based on this evaluation. The PASS assumptions and recommendations helped guide the scope of the appraisal-level investigation described in this report.

## 1.5 Appraisal-Level Investigation Scope

This Study phase investigated alternatives for delivering water and options for storing a replacement water supply.

- **Water delivery alternatives.** These alternatives consist of possible infrastructure (such as canals, pumping plants, and laterals) and possible configurations of these facilities to convey or deliver surface water to the groundwater-irrigated lands.
- **Water supply options.** Water supply options consist of various existing or proposed storage facilities that could store the replacement surface water supply for use in the Odessa Subarea.

Four water delivery alternatives and six water supply options were considered to be viable enough to investigate at the appraisal-level. The information and assumptions developed during the PASS were reviewed and verified, or revised as appropriate. Refinements included identifying specific groundwater-irrigated land areas to receive a replacement surface water supply and calculating the number of groundwater-irrigated acres served and replacement water supply volumes for each alternative. This information is presented later in this report.

The appraisal-level investigation predominantly relied on existing data and included additional limited engineering, geologic, hydrologic, and hydrogeologic analyses to assess the technical feasibility of alternatives and options and to develop preliminary cost estimates to allow comparison among alternatives. Engineering designs and cost estimates are based on previous studies and limited design data, including investigations of the East High canal system conducted in the 1960s and 1970s, construction drawings and geology logs from previous investigations, and drawings from construction of existing CBP facilities such as the East Low Canal. Limited additional data were developed (e.g., hydrologic modeling to simulate operations to help determine the sizing of canals and pumping plants).

Reclamation, with the assistance of the U.S Fish and Wildlife Service (FWS), Washington Department of Fish and Wildlife (WDFW), and Confederated Tribes of the Colville Reservation conducted a preliminary inventory of potential environmental and cultural issues and concerns.

Much of this information was obtained from Geographic Information System (GIS) databases developed by State and Federal agencies. Many of these datasets are not complete or available for the entire Study area.

When the Study moves forward into feasibility-level investigation, extensive environmental surveys and analyses will be performed to verify the presence of resources and more accurately assess effects to cultural and historic resources, species, habitat, and other possible effects.

The information presented here is appropriate for an appraisal-level investigation to identify major constraints to implementing an alternative or issues that make an alternative infeasible or potentially cost prohibitive. Reclamation's appraisal-level analyses and activities summarized in this report include:

- **Geology studies.** Inventory at appraisal-level to assist engineering efforts
- **Hydrogeology studies.** A literature review of existing data and well measurement data
- **Hydrologic modeling.** Simulations of CBP operations, alternatives, and options
- **Cultural resource surveys.** Class 1 and Traditional Cultural Properties (TCPs)
- **Fish and Wildlife Coordination Act (FWCA) consultation.** Preliminary identification of possible fish and wildlife issues
- **Engineering studies.** Appraisal-level engineering designs and analyses to verify technical feasibility and estimate costs